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Postal Markets and Electronic Substitution: Implications for Regulatory Practices and Institutions in Europe

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1. Introduction

The European postal markets are undergoing a reform which aims at promoting competition on the one hand and protecting the benefits of public services on the other. The important topics concerning postal regulation and the development of markets are: (1) market regime, (2) definition and financing of universal services, (3) market power control, and (4) emerging electronic substitution of postal services. The decrease in mail volumes due to electronic substitution is discussed in the literature (e.g., Nikali, 2008) and experts agree (see CIFS, 2009) that it will strongly impact the development of postal markets in the future. Crew et al. (2008) noted that finding an appropriate co-evolution of regulation and market development is one of the primary challenges of postal reform. The crucial question therefore is how the increasing convergence of postal and telecommunications markets can be mirrored by appropriate regulation (see also Crew and Kleindorfer, 2010).

Except for the lack of a physical infrastructure, the postal sector is not entirely different from other network industries. The postal network is highly labour intensive and not subject to high investments or sunk costs.¹ In a disaggregated approach to network regulation, postal markets are often analyzed along the value chain. Telecommunications markets are usually described based on their network layers. Following this “network layers approach”, the telecommunication network can be analyzed as consisting of a passive network layer including infrastructure, an active network layer, which sends and receives signals, and a third layer which represents the services and applications provided on this infrastructure.

Postal “Universal Services” include a minimum range of products and services, together with constraints on accessibility to the postal infrastructure as well as quality and delivery frequency requirements. Postal operators have begun to invest in digital products and combine them with traditional physical postal services. Furthermore, they increasingly aim at installing secure digital identities for their customers to provide safe electronic communication. They therefore provide complementary products and applications, such as hybrid mail, based on the network operated by telecommunication providers.

This increasing convergence between postal products and telecom applications is a new phenomenon which suggests the need for a co-evolution of regulation. But there is hardly any discussion in academia or in practice about the consequences for regulation. Relevant questions are: Which parts of current regulation will become redundant? Is there additional regulation needed due to new bottlenecks or changes in consumer behavior? In our qualitative analysis, we investigate the implications of intermodal competition and growing convergence between postal and telecommunications services on regulatory institutions and regimes. We set up a comparison between the networks and compare the scope of universal services and issues concerning market power regulation in the two different industries.

In the remainder of the chapter, we will focus on the most prominent topics, namely the comparison of regulation in the telecommunications and the postal sector as well as on the implications for regulation of the growing convergence of the sectors. Section 2 introduces the economic foundation for our discussion. In Sections 3 and 4 we develop the idea of a technologically neutral multi-channel concept that allows for a combined communications universal service approach and convergence in regulation. Section 5 concludes.

2. Foundations for Regulation in Network Industries: a Disaggregate Approach

Based on different sources of market failures, there are several dimensions of regulation in network industries (e.g., Jaag and Trinkner, 2010). Bottleneck regulation is necessary if there is persistent market power from economies of scale, scope or density in combination with sunk costs. This allows an operator to ask prices above their efficient level and therefore results in an inefficient allocation. Regulation therefore applies to access regulation to those bottlenecks that are stable.

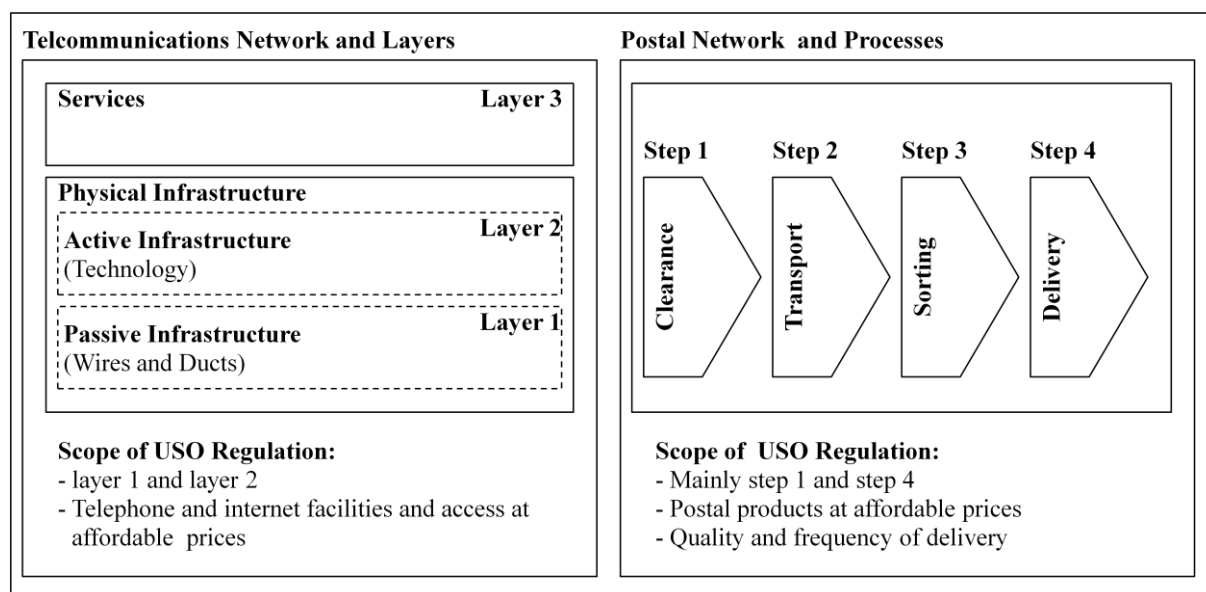
Universal service and default service regulation assures the ubiquitous availability of good quality services at affordable prices. Among other things, it defines such obligations and financing and designates one or several operators to provide these services. From an economic point of view, universal service regulation is often justified on the basis of network externalities. Similarly,

regulation of interconnection and interconnectivity can be explained by externalities between operators. This alludes to mutual termination and standards among operators.

A third source of market failures is asymmetric information. Many regulations aim to cope with such asymmetries. Examples are flanking measures like data protection or safety regulations.

According to the theory of contestable markets, the need for regulation of market power might arise where the cost structure exhibits cost subadditivity² and irreversible costs at the same time. The theory has its origins in the work of Baumol et al. (1982). The presence of cost subadditivity and sunk costs are the defining characteristics of a “monopolistic bottleneck”. If this bottleneck cannot be duplicated nor substituted by other means, it is called a “stable monopolistic bottleneck” (in US antitrust law this is referred to as an “essential facility”). Such infrastructures give the owner natural market power and potential entrants will not be able to enter the market, even if the incumbent charges excessive prices.

Figure 1: Approaches for network analysis: Telecommunications infrastructure vs. postal value chain (based on Jaag et al., 2009)



Therefore, in liberalized markets it will be crucial to ensure that new market players get timely, non-discriminatory access to stable bottleneck facilities at reasonable terms and conditions that prevent the abuse of market power. Where competition law is not sufficient to ensure such access, sector-specific regulations are necessary. Thereby, the property rights infringement inherent with access regulations should be kept to the minimal necessary amount. There are two main dimensions to minimizing such interventions.

First, there are different regulatory instruments to ensure non-discriminatory access, for example *ex-post* or *ex-ante* regulation of access prices, vertical separation, and others. These range from light regulation up to divestiture. See Jaag and Trinkner (2010) for a discussion of various models and a normative approach to assess the right regulatory remedy.

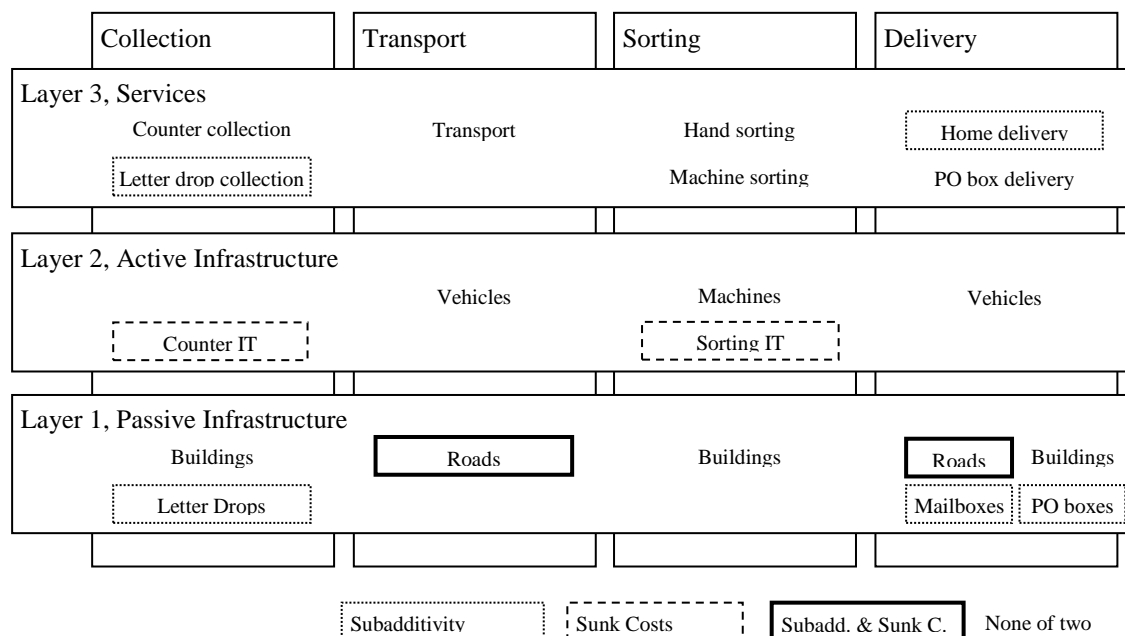
Second, there are various options depending on how precisely the bottleneck can be identified. Knieps (2000) argues for a disaggregate approach, where only the bottleneck network layers or processes are regulated, all other services remain out of the scope of access regulations. Figure 1 illustrates the relevant network layers and processes in the telecommunications and postal markets. Each layer has a specific function in the network. Some layers may be fully competitive while others constitute stable monopolistic bottlenecks. The starting point of the disaggregate approach is the differentiation between those network layers or processes in which workable (actual and potential) competition is warranted and those in which there is stable market power. The latter can be expected in layers or processes that are monopolistic bottlenecks.

This implies that both in telecommunications and in the postal sector, network layers or processes can and should be analyzed separately – notwithstanding the strong connections among the layers. Often,

monopolistic bottlenecks are located on layer 1 (the physical network infrastructure usually entailing considerable sunk costs) or in the capillary segments of the network (these segments usually entail subadditivity).

While Knieps (2002) analyzes telecommunications markets by network layers, he argues for postal markets to be analyzed by processes along the value chain. However, this does not have to be necessarily the case: Heitzler (2009) applies the “value chain approach” for telecommunications, in Figure 2 we show that by use of sufficient disaggregation, the postal market can be analyzed both along processes as well as along layers.

Figure 2: Bottleneck analysis in the postal market along layers and/or processes



When applying the disaggregate approach, it is important to investigate carefully the stability of bottlenecks. If the bottlenecks can be substituted by other means, it is not monopolistic anymore and there will be no need for regulation. Thus, with converging telecommunications and postal markets, one market might be a closer substitute for the other than it used to be in the past. This may reduce the stability of historical bottlenecks, as mobile telephony arguably did with respect to final mile competition in fixed line telephony. In particular, when considering access regulations, regulatory bodies need to understand both markets and their interactions.

3. Regulation in Telecommunications and the Postal Sector

Both the telecommunications and the postal sector have traditionally been regulated as publicly owned monopolies. With the introduction of direct competition in these sectors, their regulatory framework has changed considerably. Full liberalization in European telecommunications services and infrastructures (with delays for some member states) has been in place since 1998. According to the interconnection directive (97/33/EC), the general principle for interconnection agreements is free negotiation on a commercial basis. Following Laffont and Tirole (2000), pricing should be transparent, nondiscriminatory, and cost oriented.

Regulation in the (wire-bound) telecommunications sector usually concentrates on the network layers constituting monopolistic bottlenecks (see Knieps, 2008 as well as Jaag and Trinkner, 2010). The relevant network layers are the wide-area and last-mile passive infrastructures (ducts, cables), active infrastructures (electronic equipment) and services. All last-mile infrastructures exhibit subadditive costs, and can therefore be considered to be natural monopolies. The Commission’s Recommendation (2003/311/EC) mentioned eighteen relevant markets needing sector specific regulation. In 2007, the Commission cancelled eleven markets from the list (Recommendation 2007/679/EC). Knieps and

Zenhäusern (2009) argue that there is even more phasing-out potential. They show that only the last-mile ducts and cables are a monopolistic bottleneck which cannot (readily) be duplicated.

However, as there is increasing inter-modal competition (e.g., by wireless communication, or by new local loops established by electricity and cable companies) and fast technological progress (fiber optics), the traditional copper bottleneck in the last mile has become increasingly contested as well.

The inclusion of telecommunications services into the definition of universal service may not only be justified by concerns of structural market power. Cremer et al. (2000) provide a series of alternative economic justifications: USO as a remedy for a network externality, USO as a redistribution policy instrument, USO as a means to supply a public good, USO as an instrument to conduct regional policy.³

The Universal Service Directive (2002/22/EC) relating to electronic communications networks and services addresses universal service obligations and users' rights related to telecommunications. The Directive's aim is to ensure the ubiquitous availability of good quality services via effective competition and choice and to deal with circumstances in which users' and consumers' needs are not satisfactorily provided by commercial means. It defines a minimum set of services of specified quality to which all users and consumers should have access at an affordable price.

In 2000, OFTEL (2000) stated that at present, "high-bandwidth services do not meet the primary test for consideration as part of the USO requirement, because they are not yet services used by the majority." OFTEL (2000) continues: "But they are very rapidly developing. This progress needs to be kept under review alongside other factors relevant to the future of the USO, including the emerging EC framework, impacts on investment, funding, cross-subsidies, consumer demand and means of supply." With the emergence of widely used secure mail services and digital identities, electronic communication has become an increasingly close substitute for mail products. Therefore, regulation in telecommunications also affects hybrid forms of postal products. Postal service is one of the oldest network industries. Economics of bundling may play an important role on several stages of letter conveyance. However, alternative entry strategies emerge and can be observed in the sector: high quality letter services (e.g., express mail) as well as large volume mail delivery in selected areas. After the abolishment of all legal entry barriers, it is likely that the role of active competition will increase further.

Market failures may arise from network externalities between operators, in analogy to the termination issue in mobile telecommunication. Jaag and Trinkner (2010) as well as Knieps et al. (2009) state that in that case, ex-post access regulation and the imposition of universal service obligations might be justified. Such regulatory intervention is part of the Third Postal Directive (2008/6/EC): "It is essential to guarantee at the Community level a universal postal service encompassing a minimum range of services of specified quality to be provided in all member states at an affordable price for the benefit of all users, irrespective of their geographical location in the Community".

As there are no significant sunk costs in the postal sector, there is no bottleneck facility, which would normally be the basis for access regulation or even divestiture. De Bijl et al. (2006) conclude: "Our finding that there are no monopolistic bottlenecks in the delivery chain implies that the essential facility doctrine cannot be used to impose downstream access obligations upon the dominant postal operator." Hence we argue that competition law should be sufficient to ensure efficient market outcomes. Nevertheless, access to post office boxes or information on change of addresses is often regulated in liberalized markets. With respect to postcode databases Dieke and Schölermann (2008) conclude that incumbent postal operators should be obliged to provide up-to-date information about postcodes and regulation should ensure that all postal operators have access related to these postcodes.

4. Towards Unified Regulation

In the following we explain how the telecommunications and postal sector are converging towards a unified communications market and we describe synergies in regulation. We argue that mail delivery can be either physical or via hybrid services. Following this line of argument, universal services become a technologically neutral multi-channel concept that allows for a technology neutral universal service approach.

Converging Markets

In liberalizing postal markets, the concern of cost efficiency arises both for the USP and the regulatory authority, since the monopoly as the traditional financing mechanism falls apart. The costs of some elements of the postal universal service are presumably high; therefore, universal service providers seek ways to abate them. As a result, an increasing number of postal operators have started to invest in digital solutions to combine them with traditional physical postal services (e.g., Maegli et al., 2007). Current pilot projects include virtual mailboxes (e.g., Belgian Post, Post Denmark, and Canada Post), electronic billing and e-government efforts. Incumbent operators increasingly aim at installing secure digital identities and provide complementary services based on the telecommunications network. The relevant question is whether the universal service will be the same in the future as well as whether the evolving technologies and customer needs are changing the definition and role of the universal service. Even though postal universal services might be considered as a fairly unvarying business during the past few centuries, a slow but constant change was common in its long history. From Victorian London, where mail delivery routes went up to twelve times per day, delivery frequency has been reduced over the years to five or six times per week. Today, rapid and data-intensive communications are secured by electronic means rather than by physical delivery of letter mail. In the coming decade, technological innovation will further expand communication possibilities and as market liberalization impacts postal operators, the operators' historical and social role is likely to change further.

Hybrid solutions could herald a new era in postal universal services. For example, Swiss Post introduced "Swiss Post Box": a hybrid alternative and complement for the last mile delivery to households. Itella recently started a similar pilot project testing alternative delivery solutions, where physical mail is delivered twice a week. Arriving mail is stored in a PO box at the local postal office and receivers are informed via SMS. At the same time the letters are opened and scanned in order to send them electronically to the receiver by means of a special system. Other examples including telecommunication solutions to meet consumer needs and facilitate delivery are the PickPost-Solution of Swiss Post and the PickupPaket of Austrian Post. In the last name, the addressee is alerted instantaneously when a parcel is delivered at a designated shop defined by the receiver.

These solutions have something in common: Components of the telecommunications infrastructure complement and substitute partially the traditional last mile delivery (e.g., safe electronic mailboxes). On the service level, new services have the potential to substitute traditional universal services (e.g., secured mail). Therefore, distinct universal service regulations across the two sectors are becoming more and more blurred. A key question moving forward will be: Is it necessary and efficient to have letter mail delivered every day? What are the alternatives?

Electronic communication infrastructures and services allow for a nationwide use of telecommunications services at relatively low rates as well as for more flexibility in use than in physical communication. At the same time, national postal providers are mandated by law to provide cost-intensive postal services to every household nationwide due to the universal service obligation. The European definition of Universal Service in telecommunication services does not include explicit services and applications but requires the physical connection between households at affordable prices. Table 1 briefly summarizes various aspects of convergence in the telecommunications and postal markets concerning electronic communication. As mentioned in this Table, the two markets are converging in different areas. The most important driver of convergence is the evolution of consumer needs towards fast and secure access to messages (see CIFS 2009). The telecommunications network allows for acceleration of delivery at low costs while physical mail is more reliable but more costly. The convergence therefore relies on a combination of the strengths of both means to overcome their weaknesses.

Table 1: Aspects of converging physical and electronic messaging services⁴

	Post	Telecommunications	Trend towards convergence
<i>Consumer need</i>	Reliable written communication over long distances	Written communication over long distances	Yes, consumer ask for fast and reliable access to messages
<i>Product / Technology</i>	Letter mail and parcels	DSL, wireless	Yes, substitution by electronic messaging
<i>Frequency of service</i>	One per day (5 to 6 days per week)	Continuous	Driver for convergence -
<i>Speed</i>	Low Trend: lower (fewer deliveries per week)	High Trend: differentiated (net non-neutrality)	Driver for convergence
<i>Coverage</i>	Nationwide	Nationwide	-
<i>Reliability</i>	Reliable	Less reliable	Yes, by digital IDs provided by postal operators
<i>Confidentiality, integrity</i>	High	Rather low	Yes, people trust in brands of postal operators
<i>Price</i>	High Trend: higher	Low Trend: lower	Driver for convergence
<i>Accessibility</i>	Postal retail outlets or post box criteria based on distance	All residences and business offices on request	Driver for convergence
<i>Scenario for USO reform</i>	Reform in delivery models and frequency	Electronic convergence (fix and mobile infrastructure) or technology neutrality Increased minimum speed	Yes, by hybrid services

The increasing convergence between postal products and telecom applications is a new phenomenon which needs a corresponding co-evolution of regulation in order to exploit synergies and find proper universal service definitions in line with changing customer needs. Thus, rethinking the communications USO in general and the postal USO in particular is necessary.

The concept of technological neutrality has a rationale in the telecommunications and the postal sector too. For example, Japan chose to regulate access to the last mile independent of the technology applied (copper or new fiber wires). Similarly, universal services are often defined in technologically neutral terms. Also, consumer needs may be technologically neutral. For example, the main needs of recipients concerning postal services are physical *and* timely delivery. They do not primarily care about how these needs are satisfied as long they are satisfied. That is, the technology used by the operator to fulfill these needs is not the primary concern of the receiver. Put differently, if the delivery of a particular type of correspondence serves the needs of the recipient, independently of different technologies, its delivery is technologically neutral. But do such technologies exist to assure that the delivery of letters and other items of correspondence can be accomplished in a technologically neutral manner?

Hybrid services like Swiss Post Box improve physical delivery; it is the secure electronic complement to the physical letterbox. It guarantees a worldwide twenty-four-seven access to physical mail by scanning and emailing it in a secure unit as soon as it arrives at the sorting centre. Moreover, customers can decide to have the mail physically delivered, archived or shredded. Managing physical mail during a temporary absence becomes as easy as handling electronic messaging. As a prerequisite, broadband and mobile penetrations have to reach a critical mass. Thus, countries and governments that are strategically pushing forward their digital communications infrastructure will gain a substantial and long-lasting competitive advantage. In the case explained above, where mail delivery can be either physical or via hybrid services, universal services become a technologically neutral multi-channel concept. Technological convergence turns the technologies in the two markets to closer substitutes than in the past and functions therefore as the cutting-edge process for a technologically neutral universal service. A technologically neutral universal service has therefore an all-encompassing meaning in the communications sector and could also be referred to as “communications universal service”, and the corresponding obligation as the “communications universal service obligation”.

Regulatory Institutions

The European trend of establishing regulatory institutions leads toward integrated regulatory bodies. Most agencies are responsible for more than one sector. A majority of the EU members combine postal and electronic communications in one regulatory agency. In some member states the postal regulator is also involved in other network industries like gas, electricity, rail or even road safety (see WIK, 2009, p. 49). In the following we describe institutional solutions of cross-sectoral or integrated regulatory bodies, namely in Germany, France, Netherlands, UK and Switzerland.

The Federal Network Agency (Bundesnetzagentur) for Electricity, Gas, Telecommunications, Post and Railway is a separate higher federal authority within the German Federal Ministry of Economics and Technology. In 2005, the regulatory authority for telecommunications and postal services which replaced the Federal Ministry of Posts and Telecommunications (BMPT) and the Federal Office for Posts and Telecommunications (BAPT), was renamed Federal Network Agency. The agency also acts as the root certification authority as provided by the German Electronic Signatures Act. The Federal Network Agency's task is to provide, by liberalization and deregulation, the further development of the German network industries. For the purpose of implementing the aims of regulation, the agency has effective procedures and instruments at its disposal including also rights of information and investigation as well as the right to impose graded sanctions.⁵ In practice, the various branches of the sector-specific regulators in the *Bundesnetzagentur* have only little to do with one and another and function as separate sector-specific regulators.

The ART (Autorité de Régulation des Télécommunications) was created by the law of 1996 to regulate the telecommunications sector. In 2005 the Parliament decided to assign the responsibility for postal service regulation to the authority. Therefore, ART was renamed to ARCEP: Autorité de Régulation des Communications Electroniques et des Postes. The former telecommunications regulator is charged by the legislature with the additional responsibility to oversee the opening and operation of postal markets as well as the financing and safeguarding of the universal service. The new French postal law of 2005 reorganized the statutory and regulatory governance of the postal sector. The French postal law (Code des Postes et des Communications Electroniques) covers postal services as well as the electronic communications.⁶

The Independent Post and Telecommunications Authority of the Netherlands (OPTA) was established in the Netherlands in 1997. OPTA is allowed and required to set out the Independent Post and Telecommunications Authority Act, the Postal Act and the Telecommunications Act. On its website the regulator states: "The domains of telephony, post, internet and television are changing every day. New businesses are starting up and services are developing in a flash. There is a growing wave of new opportunities and subscriptions. OPTA ensures that there is competition and confidence in the communications sector in the interests of consumers. This mission revolves around two key points: the promotion of competition and the protection of consumers."⁷ Moreover, they conclude that today's electronic communications will already be obsolete tomorrow. The integration of telecom and postal regulation seems to be motivated by technological reasons rather than by efficiency gains.

Ofcom was established as a regulatory body by the Office of Communications Act 2002. Ofcom is the regulator for the UK communications industries, with responsibilities across television, radio, telecommunications and wireless communications services.⁸ The "Hooper Report" (2008) shed light on diverse risks and uncertainties concerning the future of UK's postal services. With respect to the shape of the sector-specific regulator Postcomm and the regulatory regime the report proposes: "A new regulatory regime is needed to place postal regulation within the broader context of the communications market. (p.15)" The Hooper Report mentioned several arguments for transferring responsibility for postal regulation from Postcomm to Ofcom: Postal services (1) are facing competition from digital media and Ofcom has a deep understanding of the entire communications sector as well as (2) experience of regulating markets facing fast technological change. Furthermore, the telecommunication regulator is (3) supposed to have experience of creating a regulatory framework for British Telecom while faced the challenge of modernization and liberalization. Nevertheless, Ofcom is (4) a large organization and has economies of scale and has (5) a deep understanding in market analysis and competition law.⁹

A unique combination of responsibility is implemented in Switzerland. The Federal Communications Commission (ComCom) is the regulatory authority for the telecommunications market. The commission is not subject to any federal council or department directives. It is organizationally and legally independent of the administrative authorities.¹⁰ The Postal Services Regulation Authority (PostReg) is the regulatory authority for the postal market, which is not fully independent of the Federal Department of the Environment, Transport, Energy and Communications. The peculiarity of the Swiss solution is the governance structure: currently, the two regulators are organizationally separated, but they share their chairman.

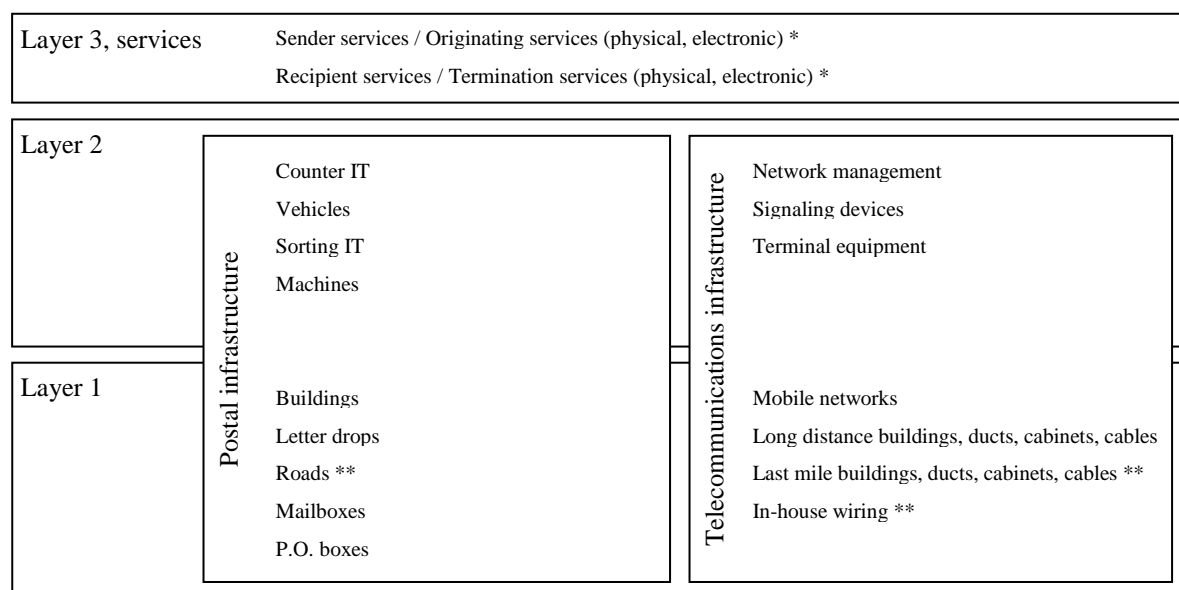
Most European countries have already merged the postal and telecom regulators organizationally in order to realize economies of scale and concentrate expertise as well as experience. But, even if several countries cover the regulation of the two markets in the same bill, the responsibilities are still separated institutionally because the responsibilities for the two markets are typically completely separated in the different departments of the regulatory authority. However, the transformation of regulatory institutions argued for here suggests the need for a more unified and coordinated approach across postal and telecommunications, not only from an organizational but also from a regulatory point of view. This is so because the historically separately regulated services are becoming increasingly interdependent: (1) Telecom infrastructures are likely to substitute last mile mail delivery and (2) consumers are likely to demand a secure combination of electronic and physical mail. In the course of the increased substitutability of physical mail by electronic communications, it is not obvious how regulation in general and regulatory institutions in particular should co-evolve. However, it is clear that there are increasing interdependencies between these two sectors, suggesting that a coordinated regulatory strategy for the two sectors will be required.

5. Conclusion

The Third European Postal Directive leaves only little space for innovative digital services in fulfilling the obligations of the universal service. The idea of a unified universal service obligation mentioned above underlies a holistic understanding of the topic, which will end in the need for a unified regulatory approach. Such an approach will likely consist of a jointly defined universal service obligation and corresponding regulation, together with a regulatory regime for bottleneck resources, similar to the layer framework in the telecommunications market.

Figure 3 summarizes the unified approach with a combined communications universal service definition and separated infrastructure regulation. This approach is built on the original idea of universal service obligations: to safeguard the public's access to a minimum range of basic services. Under the concept of a communications universal service obligation, no matter how quickly communication technologies change, the right to a minimum level of communication is of high importance for the economic development of a society. Therefore, a unified definition of the universal service consists of the basic principle of having the possibility to communicate from senders to receivers no matter whether it is physical or electronic (layer 3 in figure 3). The infrastructure of the two sectors is still regulated separately where economically necessary. Access to stable bottlenecks should be assured by regulated access for all competitors, no matter if it was formerly financed by the state or by one or more competitors. As already shown in Figure 2, this applies only for roads in the physical postal production process. Non-discriminatory access to the road system is guaranteed through other government regulation and is not part of sector-specific regulation.¹¹ In the telecommunications layer framework, only the passive infrastructures in the first layer (last mile cables, ducts or mobile radio infrastructure) constitute a bottleneck facility. In summary, the universal service is defined in layer three and regulates the physical electronic transport of messages from senders to receivers while bottleneck regulation is implemented in layer 1 where needed.

Figure 3: The communications market with a unified approach for communications USO regulation



* Universal Service Regulation

** Bottleneck Regulation

*** Subject to other Government Regulation

How could this work in practice? If receivers are connected to a broadband network, they can receive the digitalized letters via email instantly. The physical delivery with a combined bundle of items happens two or three times a week, depending on the definition of the communications USO. With this combination of physical and electronic mail, the customer's need for physical and fast delivery is satisfied. For the special case of high value or emotional value mail as for example love letters, or for the case of very urgent mail, it is still possible to pick up the item at the PO box or to order physical delivery two or three times per week.

Despite strong competition from electronic communications means, there is still a demand for physical mail. Apart from the strategic challenges for postal operators arising from electronic competition with traditional mail products (e.g. Crew and Kleindorfer, 2010), this paper has argued that future discussions on the evolution of postal services should focus on the following central questions: – How can the concept of postal services in combination with digital solutions be redefined? How can such combinations be incorporated in the definition of universal services? How should access and work-sharing regulations be redefined to accommodate the convergence noted and the innovations in hybrid communications that are growing in importance? In light of the answers to these questions, evolving solutions must be developed to continue to address the primary objective of regulation: delivering and enabling what consumers want and what they are willing to pay for.

Notes:

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¹ The necessary resources are not related to significant sunk (respectively fixed) costs; but they are rather scalable variable costs (such as labor costs) or disposable assets (e.g., vehicles or post offices).

² Subadditivity implies that the cost of producing a set of outputs as a whole are less than the costs of producing the same output subdivided in any combination of subsets. See Baumol et al 1982 for a definition.

³ Laffont and Tirole (2000) give a comprehensive overview on foundations of Universal Services in telecommunications.

⁴ Partially adopted from IPC (2010).

⁵ <http://www.bundesnetzagentur.de>

⁶ <http://www.arcep.fr>

⁷ <http://www.opta.nl/en/about-opta/tomorrow-is-made-today/>

⁸ <http://www.ofcom.org.uk>

⁹ The relevant postal services bill is currently under discussion and the transfer of the responsibilities has so far not been realized. See <http://services.parliament.uk/bills/2008-09/postalservices.html>

¹⁰ <http://www.comcom.admin.ch/index.html?lang=en>

¹¹ The sole bottleneck facility in the delivery of postal items is the road system (similar to the last mile in telecom), where non-discriminatory access is guaranteed to everyone by the state. Naturally, roads are not in the scope of the postal regulation.

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